Please read before start-up!

Operating instructions

Universal Lathes

Version of 09/2009

D2000

D2400

D3000

Walter Blombach GmbH
Tool and Machine Factory

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Dear customer!

Congratulations on choosing the **WABECO Universal Lathe**. We have taken great care in its manufacture and we have given it a thorough quality control test.

These operating instructions are to help you to work with it safely and properly.
Therefore, please read the respective instructions carefully and pay attention to them.

After unpacking the machine please check to see if any kind of damage has occurred during transportation. Any complaints must be made immediately. Complaints made at a later date **cannot** be accepted.

If you have any questions or need any spare parts, please **quote the machine number** located on the front of the motor (see nameplate).

Duplications or copies of this document of any kind, or of exerts, require a written approval by WABECO

Disposal of the lathe

The transport and protective packagings are made up of the following materials:

- corrugated cardboard
- polystyrene free of freon
- polyethelene foil
- non-returnable wooded pallet (untreated)
- Euro pallet (deposit)

If you have no further need of these articles or do not wish to use them again, please dispose of them at the public recycling facilties.

The lathe consists of up to 98% of recyclable materials, i.e. steel, cast iron, aluminium and 2% of chemical materials, e.g. the coating of electrical leads, printed circuits.
If you have trouble disposing of these parts in a proper manner, we would be pleased to help you. Upon mutual agreement we will take the complete machine back and dispose of it. However, the costs for transporting the machine to our plant must be at your expense.

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EC – Conformity Declaration

Version 07.2010

In the name of the manufacturer

Walter Blombach GmbH

Tool and Machine Factory
based in Remscheid and Neuerburg

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We hereby declare that the universal milling and drilling machines specified below

Universal Lathes Typ:
D2000 – D2400 – D3000

meet the following regulation requirements for standard series production

- **directive for machines 2006/42 EG**
- **EMV directive 89/336/EWG**

In order to meet / implement the requirements of the above mentioned directives, the following applicable and previously published standards have been adhered to:

EN ISO 12100-1
EN ISO 12100-2
EN 12840
EN 60204-1

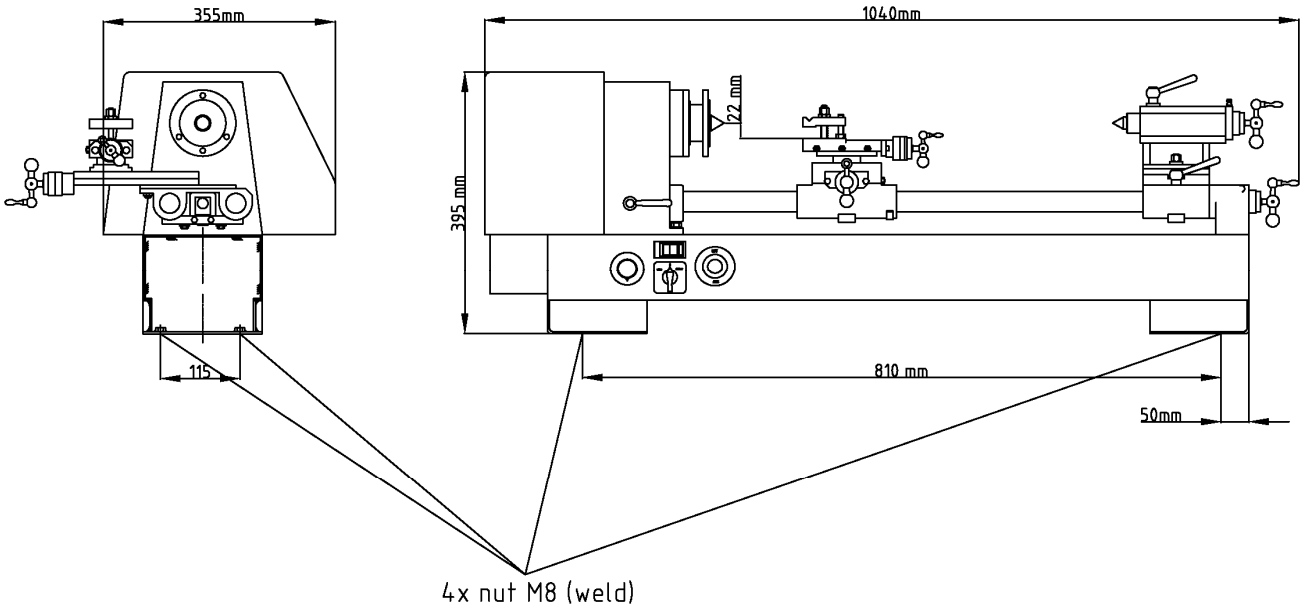
D-54673 Neuerburg

City

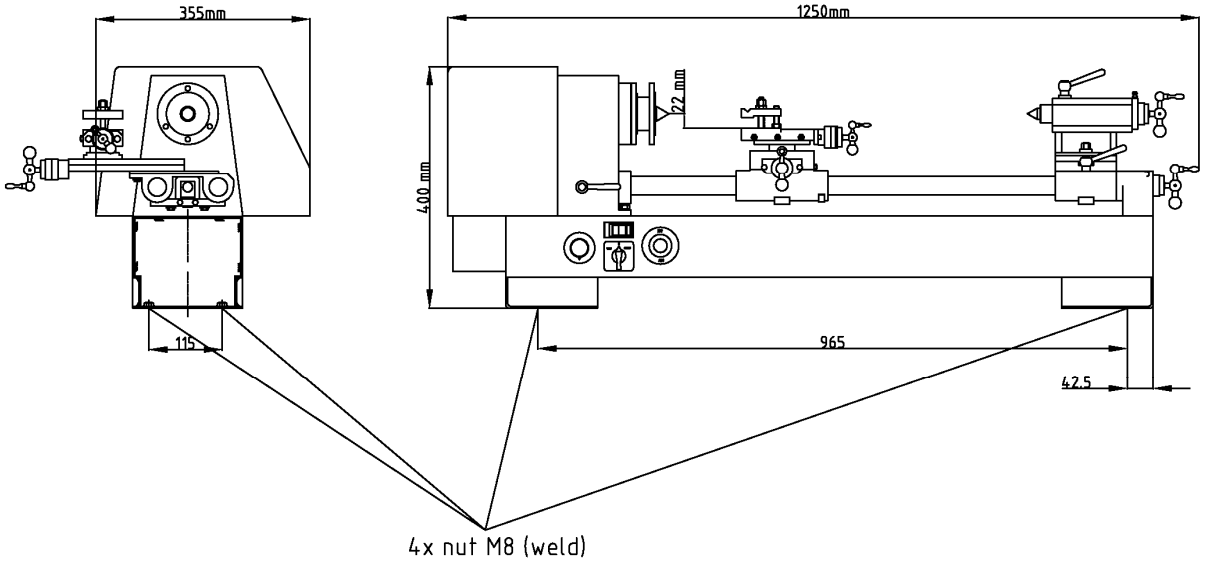
Technical Director

1. Machine dimensions

1.1 D2000

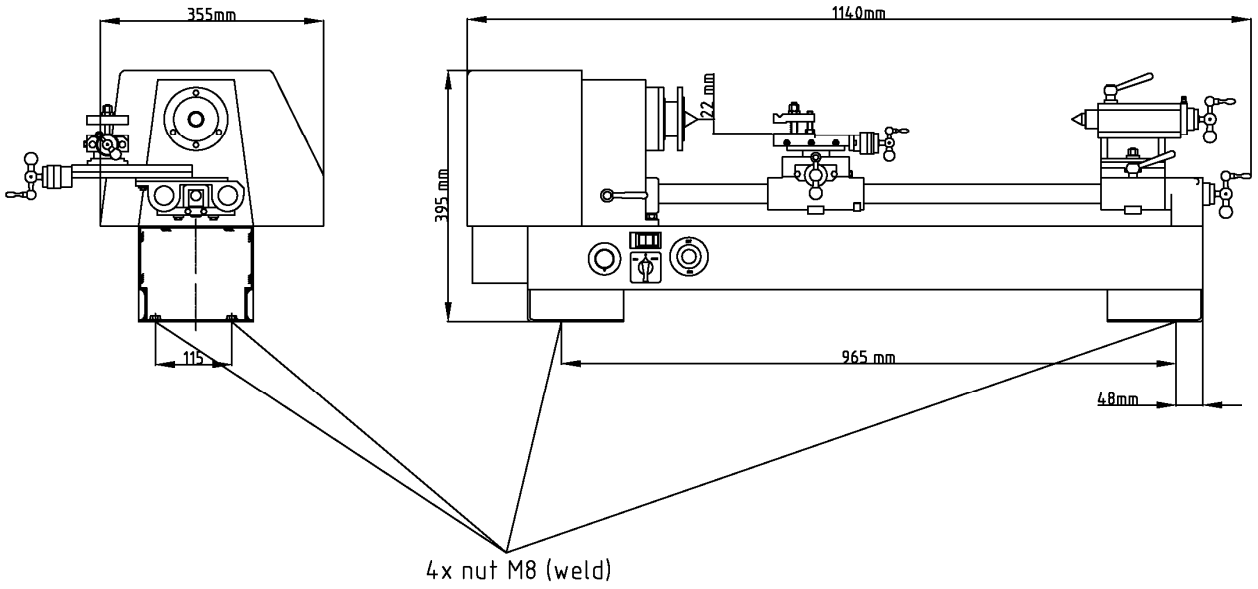


1.2 D2400



1. Machine dimensions

1.3 D3000



2. Delivery and installation

The lathes are carefully packed in our factory.

Please check the following on delivery:

1. **whether the packaging has been damaged and/or:**
2. **whether the lathe shows signs of damage in transit or if there is any other reason for complaint. In this case we request your immediate notification. Claims made at a later date cannot be accepted.**

The lathe must be installed on appropriate, plain and firm ground.

This would be, for example:

- a base cabinet such as to be found in our accessories programme
- a work bench strong enough to carry the weight of the machine without warping with an even surface (see technical data and check with spirit level).
- a steel plate

The lathe must be screwed to the base. Use the 9 mm holes in the machine base. **Good results and a minimum of vibration during operation can only be guaranteed if the above mentioned requirements for secure mounting are observed.**

The machine should be installed in a well lighted area and electrical cables with earthed sockets and O-conductors must be installed close to the machine so that the mains cable is not subject to any tension whatsoever. The mains cable should be such that, for example, by means of a multiple socket, a coolant unit can also be connected.

3. Conditions for best results

Fix the machine to a sturdy, level support.
Use sharp processing tools.
Adjust speed setting and feed to fit the material and diameter of the tool.
The clamping position of the tools is to be as close as possible to the workpiece.
Clamp the workpieces tightly and without vibrations.
Long pieces are to be supported by the tailstock or a stay.
Apply coolant and lubricant for better surface quality (finish) and dimensional accuracy.
The clamping surfaces for clamping tools and workpieces must be clean.
Grease the machine sufficiently.
Use the correct machining tools for removing the material from the workpieces.
Set the correct bearing clearances and align guides.

4. Overload protection

Wait approx. 1 second after switching off the machine manually or after an automatic switchdown following an overload before switching it on again. This will ensure that the motor is protected effectively in all work situations. Otherwise the machine may not run up again because the electronics relay could did not have enough time to react.

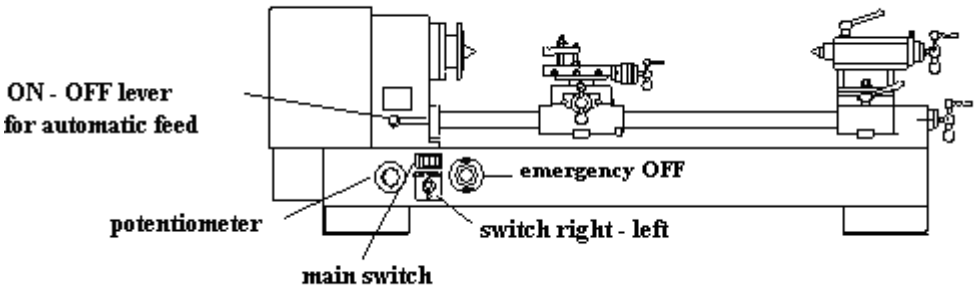
5. Safety Instructions

1. The feed line for the motor must be connected to a sealed contact socket or junction box. (Have the socket or junction box checked by an electrician beforehand; protection against children being able to put into operation).
2. The socket or junction box must be close enough to the equipment, so that the live cable is subjected to no tensile strain whatsoever.
3. When maintenance or cleaning work is done, the machine must be shutdown and the mains plug pulled out.
4. Do not slow down workpieces or chucks by hand or any other objects.
5. Wear safety goggles when working with the machine.
6. Do not remove the chips with the hand. Use corresponding aids (hand brush, hook, paint brush).
7. Always keep the protective hood of the drive closed.
8. The turning tools must be tightly clamped at the correct height and as short as possible.
9. The turning tools must never be replaced when the machine is running.
10. **Never leave the clamping chuck key in (even when not in operation).**
11. Always pay attention to the clamping width of the lathe chuck. (lathe chucks ∅ max. 40mm, drill chucks max. 100mm ∅).
12. **Never take measurements on work pieces during the lathing process** (risk of accidents and damage to the measuring gauges)
13. Do not wear loose clothing (ties, shirt sleeves, jewellery etc.).
14. When working between centres, always centre well in order to prevent the workpiece from being slung away. In addition, make sure that the locking screw of the tailstock is tightened.
15. When using the automatic feed always take care that the cross support does not get in contact with the chuck or the tailstock.
16. Never leave the machine alone when in operation.
17. **When machining wood, use the lathe centre instead of the lathe chuck to support the work piece.**
18. The machine must be secured so that it cannot be switched on by children. Make sure that other people do not operate the machine.
19. Always keep the machine dry.
20. Frequently check the machine for damage. Any damaged parts must be replaced by original parts and are to be fitted by an expert or by us.

6. Start-up and Maintenance

6.1 Electronical equipment

The lathes are fitted with a main switch with undervoltage release, i.e. this switch must be turned on before turning on the reserving switch. The main switch must also be switched on again following a power failure.



All lathes can only be switched on with closed plexiglass bonnet.

When changing the sense of rotation by turning the right-left switch, the switch must remain for 1 sec. on 0-position for the reason that the relay of the potentiometer has enough time to switch.

6.2 Start up

Prior to the initial operation, the machine must once more be cleaned with great care and all lubrication points have to be lubricated with grease. Thoroughly oil the cross support, lead screws, guiding rods and spindle sleeve.
Check all spindles by hand in order to ensure they run smoothly.
Run in the lathe on the lowest speed. A full load to start with must be avoided.

6.3 Maintenance

The working life is vitally dependent upon appropriate care. The lathe needs to be cleaned after every turning job.

In case the lathe is to be installed in a moist cellar room, all bare parts need to be oiled after use to avoid corrosion.
All moving parts must constantly lubricated with grease.
In case of backlash inside the bearings or inside the guideways of the slides, readjust in time to avoid the bearing or the guideways of the slides being destroyed.

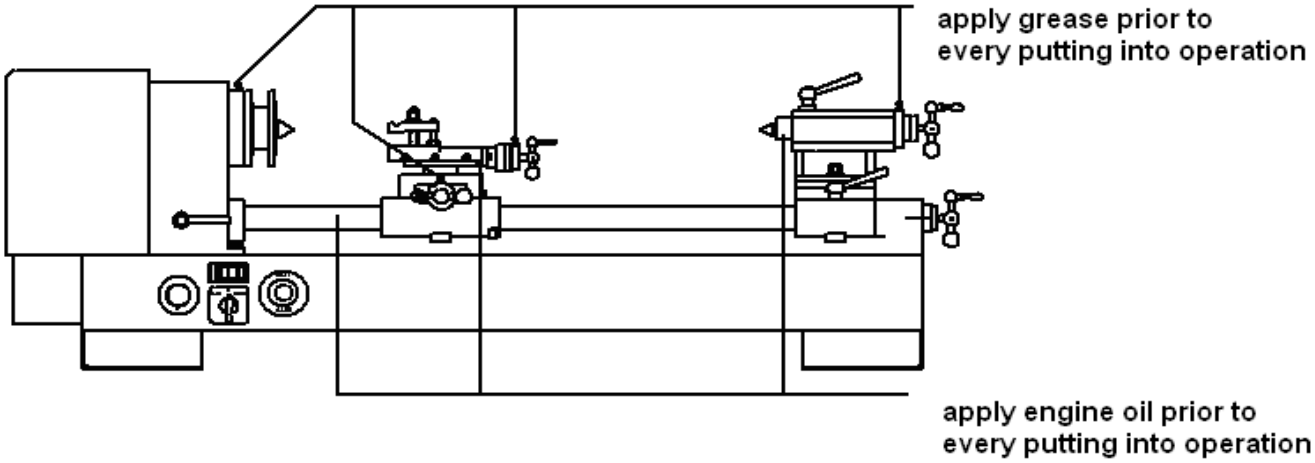
6. Start-up and Maintenance

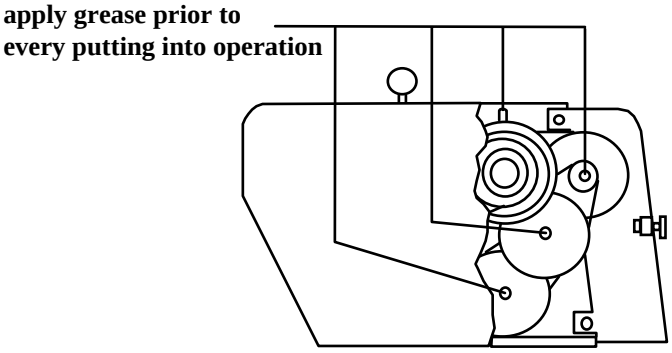
6.4 Lubrication

Prior to every putting into operation all lubricating points of the lathe must be lubricated with grease for roller bearings of commercial quality.

Both guiding bars have to be greased before every putting into operation. The two dovetail guides of the cross support, the threaded spindles accessible from below, the feed shaft as well as the tailstock sleeve have to be greased with lubricating oil every 100 service hours.

When greasing make sure to put the slide of the cross support to its hindmost position while moving the tailstock sleeve to its foremost position. The tailstock spindle is to be greased via the hollow bore in the sleeve.





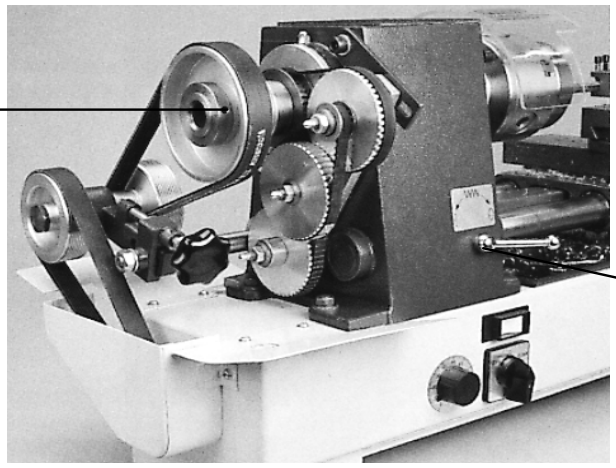
6.5 Initial cleaning of the machine

Prior to the initial operation all bare parts have to be cleaned by applying petroleum or benzine, because these parts were covered with antirust oil before leaving the factory.

6. Start-up and Maintenance

6.6 Headstock

The headstock is firmly attached to the guide bars. Inside the headstock, the work spindle is run on two adjustable precision tapered roller bearings.



If the bearings need to be readjusted, please proceed in the following manner:

1. Loosen the stud bolt in the adjustment nut. The adjustment nut is located at the rear end of the work spindle.
2. Turn the adjustment nut clockwise until the bearings run free of play again (the work spindle can easily be turned by hand).
3. Re-Tighten the stud bolt.

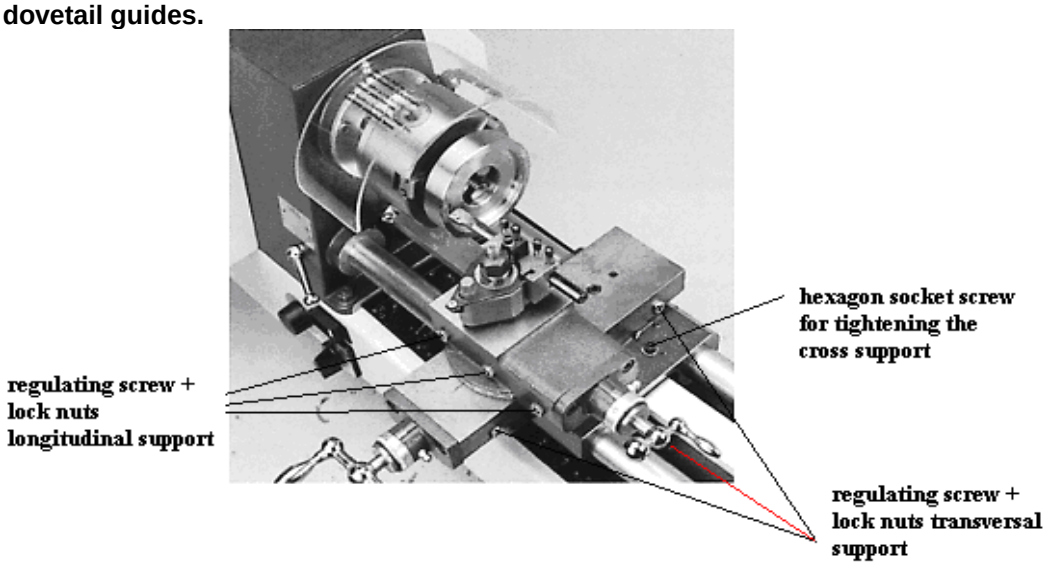
Roller bearings adjusted too tightly become useless after a short period

Automatic feed:

There is an on-off lever for the automatic feed on the front of the headstock. The machine is delivered with the wheels for feed 0.085 mm/rev. attached.

6.7 Cross support

The cross support consists of a longitudinal and a transversal support. It is equipped with **ajustable dovetail guides.**



6. Startup and Maintenance

6.7 Cross support

If adjustment becomes necessary, please proceed in the following manner:

1. Loosen the lock nuts.
2. Tighten the readjustment screws by using a socket head wrench until the slides can easily be moved to and fro by means of the crank.
3. Re-tighten the lock nuts after the adjustment.

Longitudinal support:

The longitudinal support which is mounted to the transversal support is pivotable by 360°. Thus, it is suitable for the **turning of tapers**. Adjust the position by loosening the two screws located on the outer sides of the transverse support with a 4 mm allen key. The arrow on the transversal support indicates the position of the longitudinal support in degrees. There is a degree scale on the longitudinal support. The distance between two graduation marks represents one degree.

Graduated collars:

The support spindles are provided with graduation collars with graduation marks used for setting the turning tools. One graduation mark represents a **0.05 mm** feed adjustment which corresponds to a 0.1 mm chip removal from the workpiece at the transversal slide and a 0.05 mm chip removal at the longitudinal slide. The hexagon socket screw serves for locking the cross support to the guide bars (e.g. in face turning.) The screw pulls the block at the bottom of the transverse support against the two guide bars.

6.8 Tailstock

The tailstock is attached to the guide bars in such a way that it is slidable. It can be be locked in any position by actuating the lower T-handle (4251). It can be separated into barrel and base. By loosening the hexagon bolt (424), the tailstock barrel can be pushed to either side by up to 10 mm and is, therefore, suitable for the **machining of slight tapers**. After completion of the taper machining, move the tailstock to its home position.

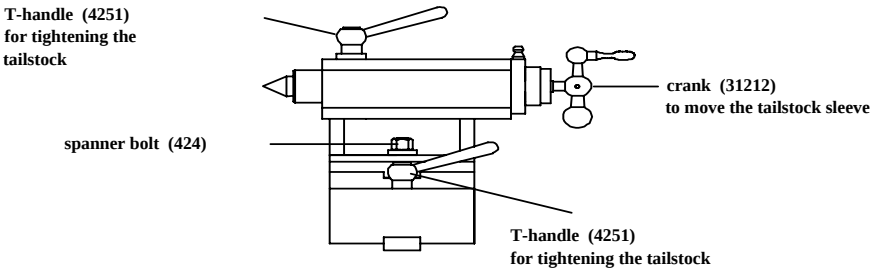
The lateral mark indicates the central position of the tailstock. Find out by doing some trial turning if the workpiece is cylindrical and correct the tailstock position if necessary.

Solid tailstock sleeve:

The solid tailstock sleeve, which is provided with a millimetre scale, is designed in such a way that the lathe centre, drill barrel or chuck are **automatically ejected** during the backward motion.

Tool clamping:

An **inner taper MT 2** is available for holding the tool. It is integrated in the sleeve. By tightening the upper T-handle (4251), the tailstock sleeve can be clamped easily in any position. The sleeve can be moved axially by the crank (31212) located at the rear end via the threaded spindle.



7. Speed regulation

7.1 Speed selection

The spindle speed is to be selected according to material type and the diameter of the work piece:

Small diameter $\Rightarrow$ **relatively high speed**

Large diameter $\Rightarrow$ **low speed**

The cutting speed is the result of rotational speed and diameter.

With a known and required cutting speed, the necessary spindle speed can be calculated in the following way:

$$\text{speed (n)} = \frac{\text{cutting speed (V) x 1000}}{\text{diameter of workpiece (d) x 3,14}}$$

Example: An aluminium workpiece which has a diameter of 20 mm is to be turned with a cutting speed of 100 m/min.

$$\frac{100 \times 1{,}000}{20 \times 3.14} = \frac{100{,}000}{62.8} = 1592\ ^{1}/\text{min}$$

Now, from those speeds available, the one which is closest to the ideal speed of 1592 ^{1}/min. is selected (in our case 1600 ^{1}/min.).

7.1.1 Speed setting for working with Aluminium

workpiece- Ø	approx. r.p.m.	cutting speed m/min
10 mm	2300	75
20 mm	1600	100
40 mm	800	100
60 mm	530	100
80 mm	400	100
100 mm	320	100

7.1.2 Speed setting for working with steel

workpiece- Ø	approx. r.p.m.	cutting speed m/min
10 mm	1600	50
20 mm	800	50
40 mm	400	50
60 mm	270	50
80 mm	200	50
100 mm	160	50

7. Speed regulation

7.1.3 Speed setting for working with Brass, Copper

workpiece- Ø	approx. r.p.m..	cutting speed m/min
10 mm	2300	80
20 mm	1270	80
40 mm	640	80
60 mm	425	80
80 mm	320	80
100 mm	250	80

7.2 Speed change

Rotational speed range 45 - 2300 min^{-1}:

The rotational speed of the work spindle is infinitely variable between 45 and 400 r.p.m. in the 1st step or in the 2nd step between 200-2300 r.p.m using the potentiometer on the front side of the machine.

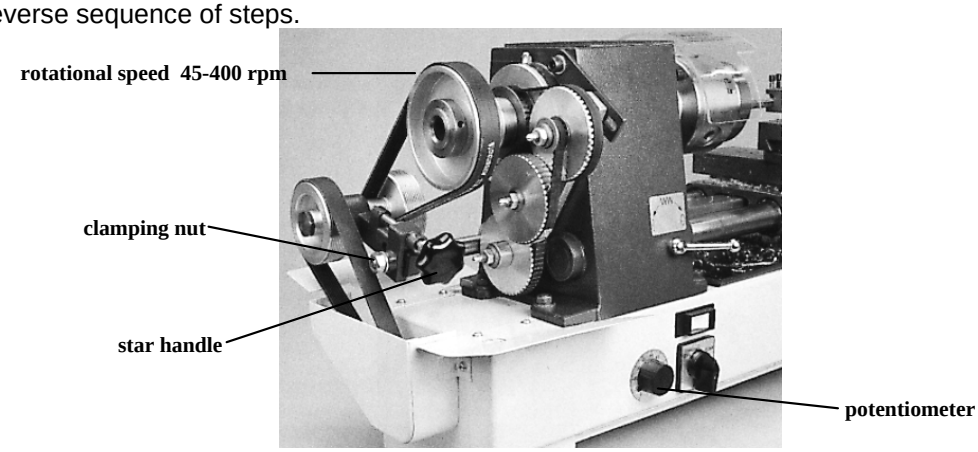
speed setting at the potentiometer	1. step r.p.m.	2. step r.p.m.
10	45	200
20	105	350
30	175	740
40	260	1050
50	325	1440
60	360	1650
70	400	1860
80	460	2120
90	490	2160
100	500	2300

Rotational speed 45 - 400 r.p.m.:

The drive belt must be relocated if the lower speed level with a minimum speed of 45 r.p.m. is required.

Proceed as follows:

Remove the protective cover and release the drive belt by unscrewing the clamping nut and turning the star handle clockwise until the drive belt can be relocated. Then re-tighten the drive belt in the reverse sequence of steps.



8. Applications

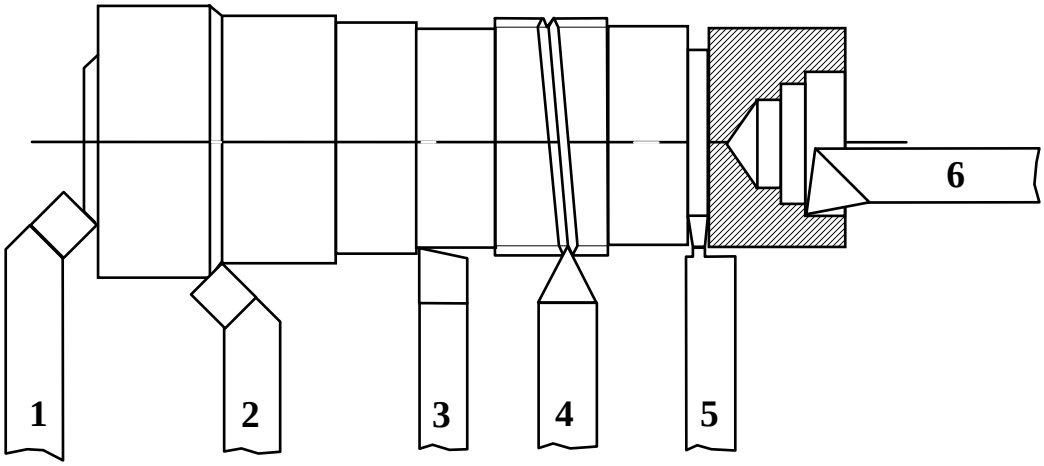
8.1 Longitudinal and transverse turning

Longitudinal turning:

In the case of longitudinal turning the tool moves parallel to the axis of the workpiece. For longitudinal rough turning it is recommended to use either a straight or an arcuated turning tool. For finishing it is best to use pointed or wide turning tools.

Transverse turning:

The maching of the end faces is known as transverse turning. In the case of transverse turning, the turning tool is moved at 90 degrees to the turning axis of the piece being turned. In so doing the cross support is to be locked. The main cutting lip of the turning tool is to be exactly centred, so that no lug remains in the workpiece centre. The arcuated tool is used for transverse turning.



to 1+2: **Roughing tools arcuated to the left and/or to the right:** By using them a maximum of material is removed in as short a time as possible (without paying attention to the finish on the surface of the work piece). They can be used for longitudinal and transverse turning.

to 3: **Offset side turning tool:** Used for finishing (smooth surface) in the case of longitudinal and transverse turning.

to 4: **Outside thread turning tool:** Used for cutting outside threads.

to 5: **Parting tool:** Used for the cutting of grooves and slicing of workpieces.

When inserting the parting tool No. 5, pay careful attention to the exactness of the centre height of the turning tool. Work on low speed and cool the tool (use soluble oil or emulsion for cooling: serves to lubricate and for the removal of chips.) The parting tool is to be clamped as short as possible and at 90° degrees to the workpiece.

to 6: **Inside turning tool:** Used for the hollowing-out boreholes. Clamp as short as possible in order to avoid vibrations of the turning tool which might otherwise occur (uneven surface).

8. Applications

8.1 Longitudinal and transverse turning

For the reason of the force effect at the turning tool take care that the tool is short and tightly clamped. If the lever arm is to long the turning chisel curves and springs back. The cutting part enters uneven into the workpiece and is producing a waved surface.
Take care that the turning tool is directed to the centre of the work piece.
The height position in the workpiece centre is regulated via the live lathe centre inside the tailstock.
The height position of the turning tool is achieved by straight sheet steel.

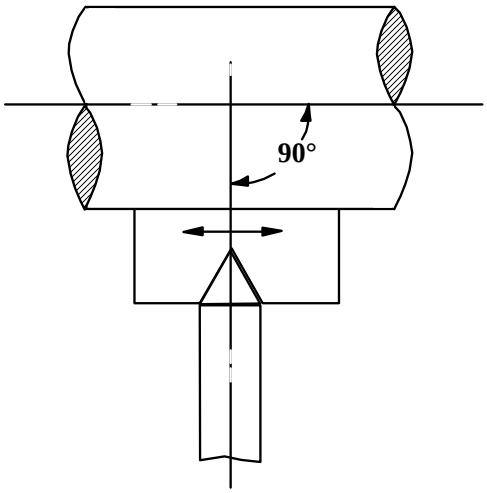
8.2 Thread cutting with automatic feed

8.2.1 General note

The thread cutting tool is a shape turning tool with the profile of the thread to be cut. It is ground according to jigs (diagram 1) and must be adjusted exactly to the workpiece centre as, otherwise, the profile of the thread would be distorted.

In order to obtain the correct position of the thread flanks to the axis of the workpiece, the grinding jig is put against the work piece and the turning tool is adjusted in accordance with it (diagram 1). For this purpose the jig is put successively on to both flanks of the turning tool. The feed of the thread cutting tool is effected over the lead screw and must correspond to the thread pitch.

Setting the thread cutting tool



Change gears:
The connection between the feed gear and the lead screw is made by the change gear wheels (optional for D2000, D2000 and D2400). By putting on various combinations of gear wheels it is possible to cut a metric right-hand thread with a pitch of 0.4 mm - 3 mm and an inch-system right-hand thread with a pitch of 10Z/1" - 32 Z/1" (see table “table for thread cutting and automatic feed”). The various distances between the gear axes can be adjusted by swiveling the quadrant and by re-adjusting the quadrant bolts.

8. Applications

8.2.1 General note

Feed:

The feed is switched on by means of the T-handle on the front side of the headstock.

When cutting threads it must be remembered that the feed remains on throughout to ensure that the turning chisel always returns to the same positon when repeating the thread cutting process. For this reason, the turning chisel is cammed out with the transversal support after completing the cut, as otherwise, the flanks and cutting edges could be damaged, and is returned to its original position by altering the turning direction of the motor via the reversing switch. It is advisable to make a 4-5 mm wide groove at the end of the thread in order to facilitate the camming out of the thread cutting tool.

Long threads:

In the case of long threads always use a live lathe centre in order to prevent the work piece from being pushed away.

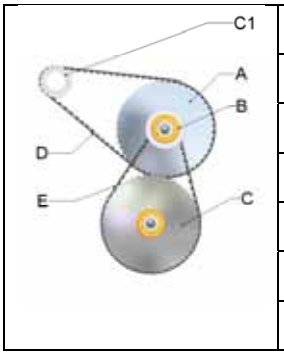
Overload clutch:

To avoid damage to the feed system, the lead screw and the lead screw drive are connected to an overload clutch.

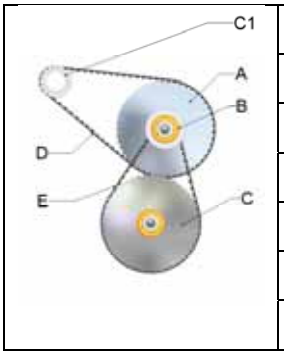
8.2.2 Application of change gears for D2000 and D2400

For the purpose of automatic longitudinal turning there are two feed rates available: 0.085 mm and 0.16 mm/revolution. (The machine is delivered with the gears producing a feed of 0.085 mm/revolution put on). Putting on different combinations of gears enables you to cut metric threads ranging from 0.35 to 6.0 mm in pitch. The same applies to inch thread ranging from 10 threads/" to 36 threads/" in pitch.

Table on thread cutting * = optional accessories



mm	0.35	0.4	0.5	0.7	0.75	0.8	1.0	1.25	1.5	1.75
A	40	48	48	48	48	48	48	48	48	48
B	14	16	20	14	18	16	14	20	36	28
C	48	40	40	20	24	20	14	16	24	16
C1	32	32	32	32	32	32	32	32	32	32
D	120	120	120	120	120	120	120	120	120	120
E	140	140	140	140	140	140	140	140	140	140

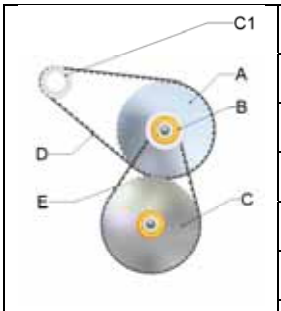


mm	2.0	2.5	3.0	3.5	3.75	4.0	4.25	4.5	5.0	6.0
A	48	48	48	48	32	24	24	24	24	24
B	40	40	48	28	40	32	34	36	40	48
C	20	16	16	16	16	16	16	16	16	16
C1	32	32	32	32	32	32	32	32	32	32
D	120	120	120	120	120	120	120	120	120	120
E	140	140	140	140	140	140	140	140	140	140

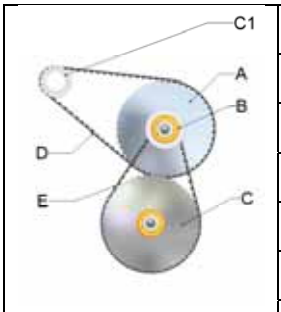
8. Applications

8.2.2 Application of change gears for D2000 and D2400

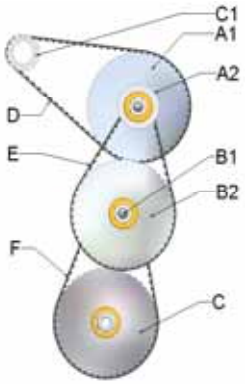
Table for thread cutting * = optional accessories



Z/1“	10	11	12	13	14	16	18	19	20	22
A	34	34	34	34	34	34	34	34	34	34
B	36	36	36	36	36	36	14	34	18	18
C	20	22	24	26	28	32	14	36	20	22
C1	32	32	32	32	32	32	32	32	32	32
D	120	120	120	120	120	120	120	120	120	120
E	140	140	140	140	140	140	140	140	140	140



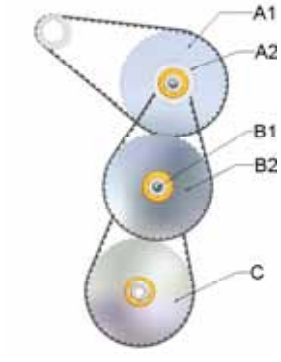
Z/1“	24	26	28	30	32	34	36
A	34	34	34	34	34	34	34
B	24	18	18	24	18	18	14
C	32	26	28	40	32	34	28
C1	32	32	32	32	32	32	32
D	120	120	120	120	120	120	120
E	140	140	140	140	140	140	140



mm	0,25	0,30
A1	48	40
A2	22	22
B1	40	40
B2	22	22
C	48	48
D	120	120
E	120	120
F	140	140

A2 and B2 front toothed wheel!
A1 and B1 rear toothed wheel!

Table for automatic longitudinal feed



mm/σ	0,085	0,16
A1	48	48
A2	14	18
B1	48	48
B2	14	20
C	48	48

8. Applications

8.2.3 Altering the feeds or thread pitches for D2000 and D2400

When altering the feeds or thread pitches, proceed as follows:

1. Changing the feed from 0.085 mm to 0.16 mm

a. Loosen fixing screw D of the change gear quadrant.

b. Loosen and remove the hexagon nuts and washers from the bolts A and B.

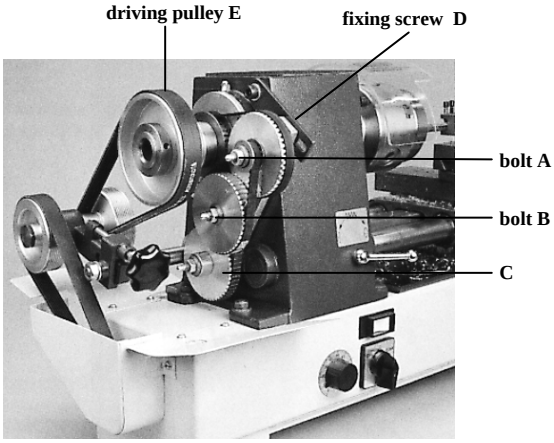
c. Loosen the hexagon bolts A and B. Remove the toothed belt connecting A and B. Unscrew bolt B together with the two tooth belt pulleys from the quadrant and remove it by slightly tilting the bolt upwards (this at the same time leaves free the toothed belt from B to C). Remove the toothed belt connecting the main spindle with A by placing the toothed belt onto driving pulley E.

d. Remove both tooth belt pulleys Z 14 from bolts A and B and replace them by toothed belt pulley Z 18 or toothed belt pulley Z 20, respectively. Mount and tighten the washers and nuts to A and B.

e. Mount bolt B together with both tooth belt pulleys to the change gear quadrant again by slightly tilting the bolt and screwing it into the square nut located behind the quadrant. Put on the toothed belt connecting B and C, pull bolt B upwards imparting tension to the toothed belt. Then, tighten bolt B. Put on toothed belt from main spindle to bolt A and from bolt A to bolt B.

f. Pull bolt A upwards until the toothed belt is strained, then tighten bolt A. Strain the belt between main spindle and bolt A by means of the change gear quadrant and tighten the quadrant with screw D.

g. Close the cover and re-tighten the hexagon socket screw.



8. Applications

8.2.3 Altering the feeds or thread pitches for D2000 and D2400

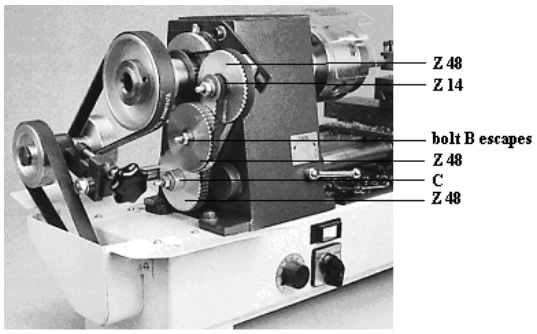
2. Changing the feed from 0.085 mm to a metric pitch of 1.5 mm

a. - c. Start the procedure exactly as already described under pos. 1, a-c, with the exception that the hexagon nut must be removed from the quadrant bushing C, too, as additional step of the procedure described under pos. 1 b.

d. Pull the bushing and the tooth belt pulley Z 48 off the quadrant bushing C. Put the bushing and the tooth belt pulley Z 24 onto the quadrant bushing C, but make sure that the bushing **precedes** the tooth belt pulley. **Bolt B with toothed belt is not needed for thread cutting!**

e. Pull off tooth belt pulley Z 14 from bolt A and put on tooth belt pulley Z 36. Put on the toothed belt from the main spindle to bolt A as well as the belt between A and C.

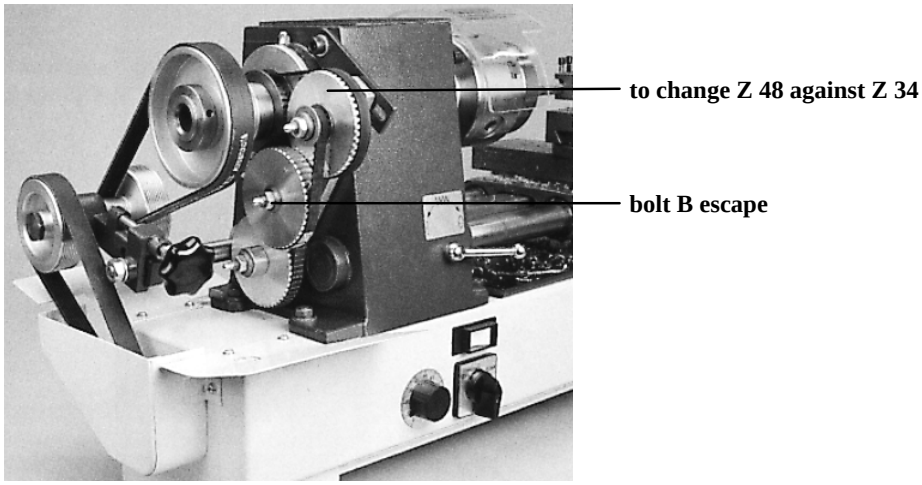
f. - g. Proceed as described under pos. 1, f-g!



Only the two short toothed belts (1145) are required for cutting metric threads as well as the slightly longer toothed belt (1146), which connects the main spindle with wheel A. The toothed belt (1145) connects wheel B with wheel C.

3. Changing the feed from 0.085 mm to thread pitch 12 threads/"

Proceed exactly as already described under pos. 2. The procedure differs merely in additionally replacing the tooth belt pulley Z 48 running on bolt A by the tooth belt pulley Z 34.



As when cutting metric threads, in most cases only the two shorter toothed belts (1145) are required. Exception: For a lead of 13. 14. 16 or 19 threads/inch. In this case, the longer toothed belt (1146) is required to connect wheels A and C.

8. Applications

8.2.4 Altering the feeds or thread pitch for D3000

1. Working with the automatic longitudinal feed

a. Turn the gear lever (19) to the symbol longitudinal turning. Slightly turn the lead screw by means of the ball ended crank (31212) until the clutch disc engages.

b. Switch-on the direction switch on the right of the substructure.
middle position = off
left pressed = feed to the spindle
right pressed = feed to the tailstock
Adjust the feed speed with the potentiometer.

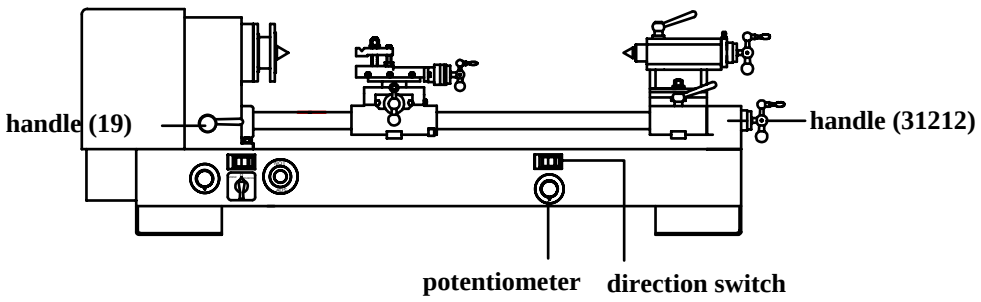
c. After completion of the automatic longitudinal turning, turn the direction switch to the middle position again.

2. Working with the thread cutting unit

a At first the change gears needed for the desired thread pitch have to be mounted. The machine is delivered with the wheels Z 36 and Z 24 for a thread pitch of 1.5 mm put on. When cutting metric threads toothed wheel Z 48 remains on the change gear quadrant as indicated in table 6.22. When cutting inch threads this wheel has to be replaced by toothed wheel Z 34.
For the different thread pitches only the tooth wheels B (beside Z 48) and C (on the main spindle) are to be changed according to table 6.22.

b. Pre-select slowest spindle speed.

c. Turn the gear lever (19) to the symbol thread cutting. The lever must remain in this position until the entire thread has been cut. For repeating the cutting process the machine must be stopped by turning the reversing switch at the end of the cutting process and the thread cutting tool is being removed from the cutting area. Now turn the reversing switch to left turning and the support moves towards the tailstock. When the thread cutting tool is located approx. 5 mm away from the thread start, stop the machine and move the transversal support to the starting position of the first cut adding the desired chip removal. Then turn the reversing switch to right turning and start the thread cutting process. The gear lever (19) remains in this position until the thread cutting process has been completed.

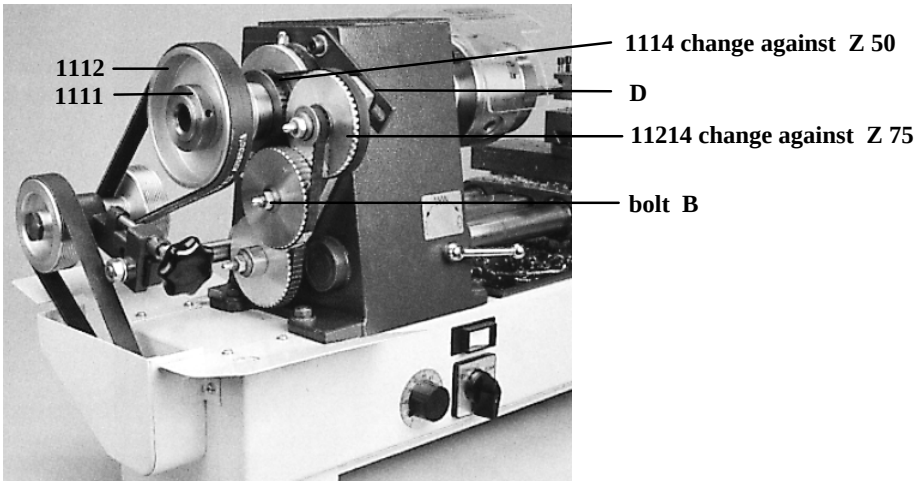


9. Pair of toothed wheels for left-hand thread cutting

For cutting left-hand threads, toothed belt wheel No. 11214 on bolt A must be replaced by toothed wheel Z 75 and toothed belt wheel No. 1114 on the main spindle must be replaced by toothed belt wheel Z 50.

To do this, proceed in the following manner:

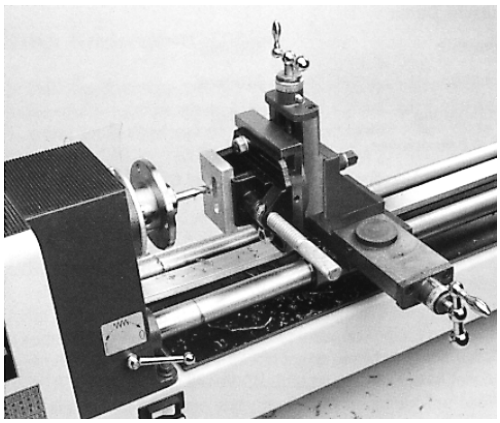
a. Pull the mains plug, loosen the hexagon socket screw on the front of the headstock and open the cover. Remove the belt from the main spindle.
b. Loosen lock screw D of the quadrant. Loosen bolt A and B on the quadrant and remove the toothed belt.
c. Shift bolt A on the quadrant upwards and bolt B downwards.
d. Loosen and remove the nut and washer of bolt A. Remove the toothed belt wheels No. 114114 and No. 11214 from bolt A.
e Loosen the headless pin on the adjustment nut No. 1111 of the workspindle, loosen the adjustment nut and remove it from the main spindle.
f. Remove the V-belt pulley No. 1112, the distance piece No. 1113 and the toothed belt wheel No. 1114 from the workspindle. Mount the toothed belt of the main spindle and tighten with the adjustment nut.
g. Mount toothed wheel Z 75 and toothed belt wheel No. 114114 onto bolt A and tighten with the washer and the hexagon nut.
h. Mount toothed wheel Z 50, distance piece No. 1113 and V-belt pulley No. 1112 on to the main spindle and tighten with the adjustment nut.
i. Pay attention to the correct adjustment of the tapered roller bearings, see section“headstock“
j. Put on the toothed belt from A to B, cam in the toothed gear Z 75 with Z 50 by swivelling the quadrant, tighten lock screw D. Strain the toothed belt between A to B by shifting B.
k. Put the V belt on the workspindle and strain it. Close the cover and screw it to the headstock with the hexagon socket.



10. Angle plate with milling table

For drilling and milling

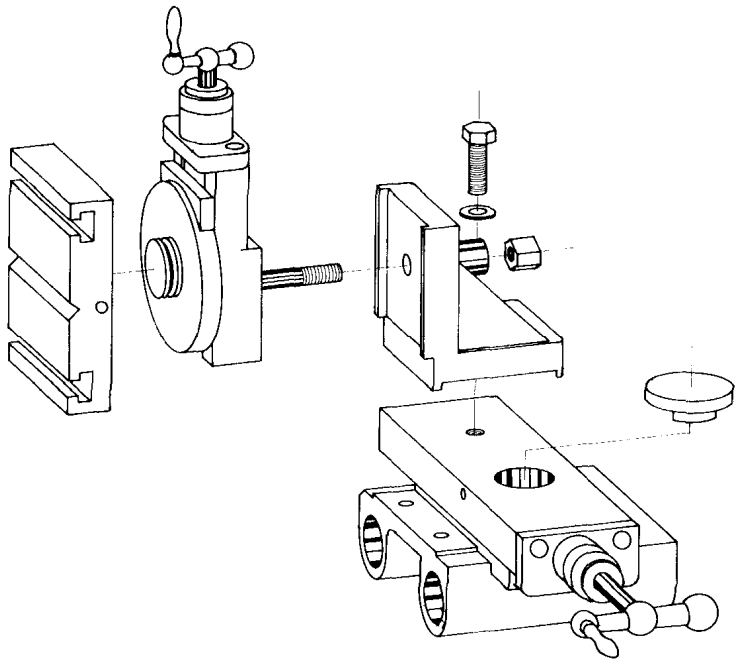
The milling function serves for machining flat surfaces and grooves. When milling with the angle plate the feed motion is effected from the workpiece. If the angle plate is mounted correctly to the cross support (see assembly instructions), the work piece can be rigidly and firmly attached to the clamping plate. It should be clean of dirt and chips beforehand in order to guarantee a good rest. The clamping screws used are inserted into the T-slot of the clamping plate. In addition, a machine vice can be attached to the clamping plate. The tool is to be clamped as short as possible into the collet (danger of breakage). If the tool is firmly clamped, the depth adjustment is done via the feed shaft.



Assembly of the angle plate with milling table

At first remove the longitudinal support from the transversal support of the lathe. Then the angle plate is screwed to the carriage of the transversal support with the delivered hexagon screw.

After removing the clamping plate and the spring from the longitudinal support, mount the longitudinal support to the angle plate as indicated below. The angle plate (milling table) is clamped to the pivot pin of the transversal support by using the two lateral tap bolts. In a final step the dust guard is to be put in the centre bore of the transversal support.



11. Lubrication coolant unit

The lubrication coolant unit consists of:

1. Tray with lubrication coolant tank which supplies the feed pump with lubrication coolant. General content of 19 litres.
2. Feed pump with the following electrical data
   - nominal voltage 230 V
   - frequency 50 Hz
   - nominal current input 0.4A
   - nominal output 0.07 kW
   - ON-OFF switch and mains supply with a length of 2 m with earthed plug.
3. Adjustable, flexible pressure hose with stop valve and nozzle for transporting the cooling lubricant to the machining area.

When using lubrication coolant, especially water based emulsions, a number of health and safety measures must be observed, which we would like to recommend:

1. Use concentrated products free of nitrites.
2. Use concentrates without secondary amins.
3. Use products with the lowest possible allergy potential.

When mixing a refill of cooling lubricant, please observe the following:

- clean / rinse the circulation system (tray / filter)
- determine the concentration necessary to meet the technical demands
- (concentrate: water 1:5 – 1:30)
- check the water has a low level of nitrites (< 50 mg NO 3-, test strip)

A cleaning plan should determine at what intervals the system should be cleaned of swarf and other waste.

A service plan should determine the following:

- when to check the concentration in use (daily / weekly)
- when to check the pH values (weekly)
- when to check / assess the bacteria count (monthly)
- when to check the nitrate content (weekly)

(The information in brackets can be varied according to the production circumstances.

In order to reduce splashing, we recommend the attachment of a splash guard and / or reducing the amount sprayed from the nozzle.

Since steps to protect the skin must be taken, it is advisable to wear gloves and aprons. The skin should be cleaned with acidic syndets without abrasive ingredients and rich cream should be applied to regenerate the skin.

Please also take note of the enclosed information on the general operating instructions.

12. Declaration of noise levels in accordance with DIN EN 24871 (German Industrial Standard)

Noise levels while running idle

Acoustic power level	**67 dB (A)**
Sound pressure level at operator's ear	**63 dB (A)**

The stated values reflect emission levels and not necessarily working levels. Although there is a correlation between the level of emission and the level of stress, this cannot be used reliably in order to determine whether additional safety measures are necessary or not.
Other factors which influence the actual stress level of employees are the characteristics of the working area, other sources of noise, i.e. the number of machines and other processes going on nearby and so on. Apart from that, the permitted stress levels may vary from country to country. This information is to allow the user of the machine to assess the dangers and risks more accurately.

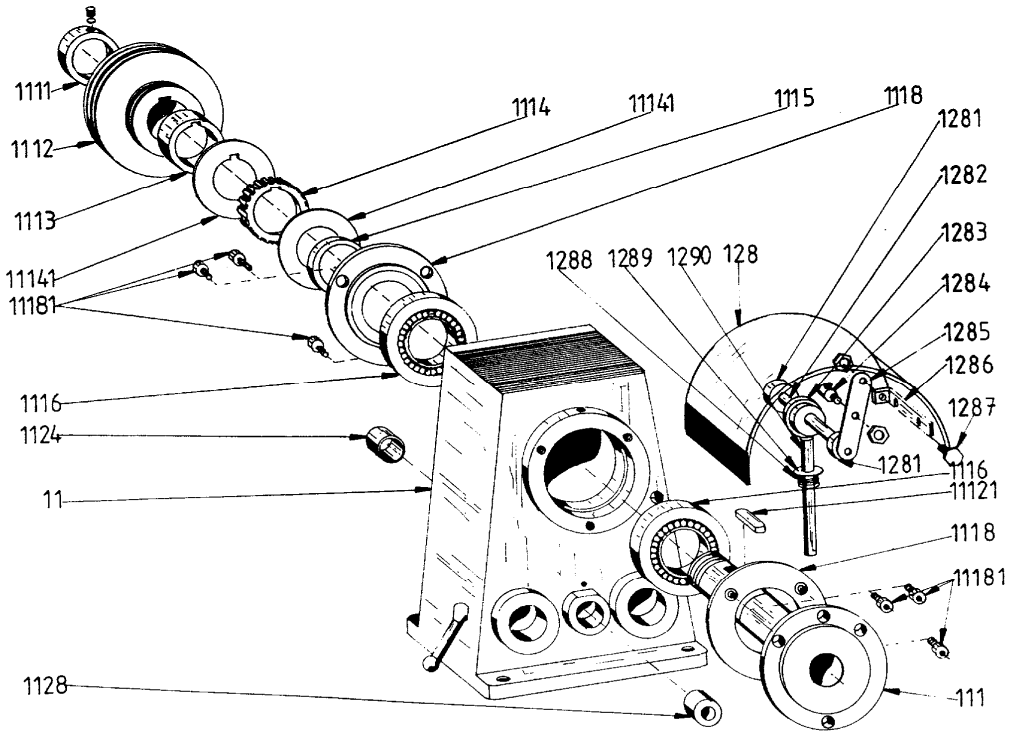
Noise levels in accordance with DIN 45635 - part 1
noise level in work area
idle phase LpA = 63 dB(A)
load phase LpA = 67 dB(A)

13. Drawings and list of parts

13.1 Headstock

for D2000, D2400 and D3000

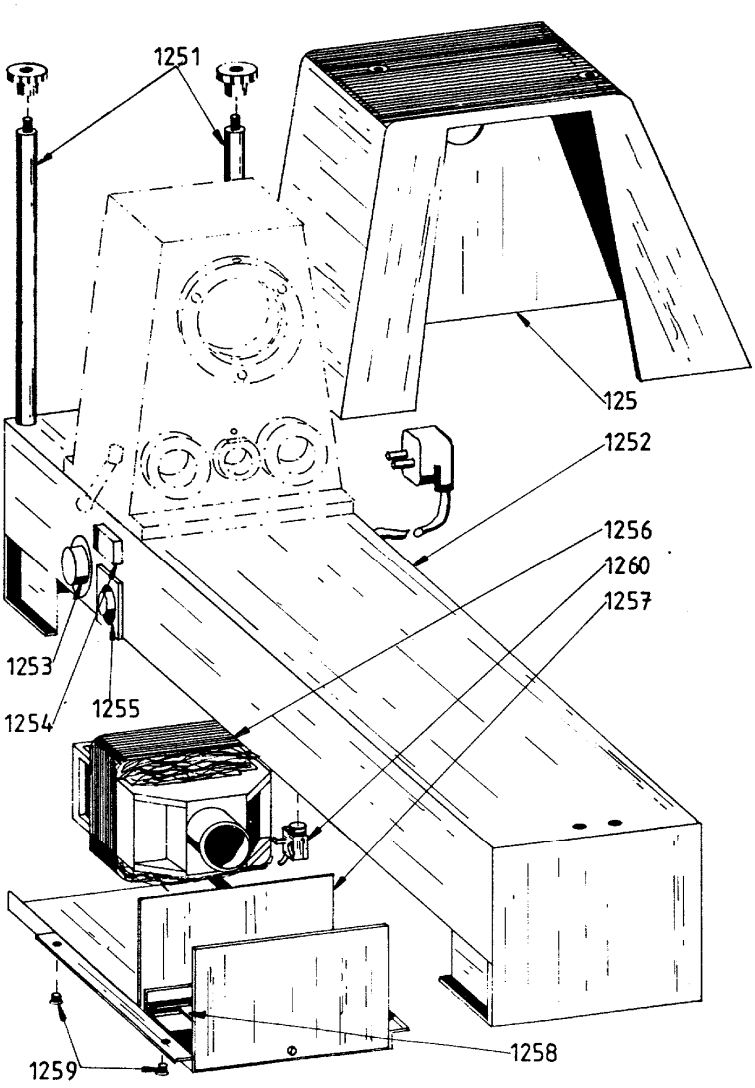
Part-No.	Order-No.	Designation
11	10200011	Headstock
1124	10201124	Bronze bushing
1128	10201128	Bronze bushing
111	10200111	Spindle with flange
1118	10201118	Bearing cap
11181	10211181	Hexagon socket screw
11121	10211121	Feather key
1115	10201115	Spacer sleeve
1116	10201116	Tapered roller bearing
11141	10211141	Starter pulley
1114	10201114	Toothed belt pulley
1113	10201113	Spacer sleeve
1112	10101112	Belt pulley **for D2000**
1112	10201112	Belt pulley **for D2400**
1111	10201111	Regulating nut
128	10200128	Plexiglass cover
1281	10201281	Adjusting ring
1282	10201282	Shaft
1283	10201283	Eccentric
1284	10201284	Stop
1285	10201285	Bracket
1286	10201286	Angle piece
1287	10201287	Hexagon bolt with nut
1288	10201288	Pressure spring
1289	10201289	Lock washer
1290	10201290	Pin



13. Drawings and list of parts

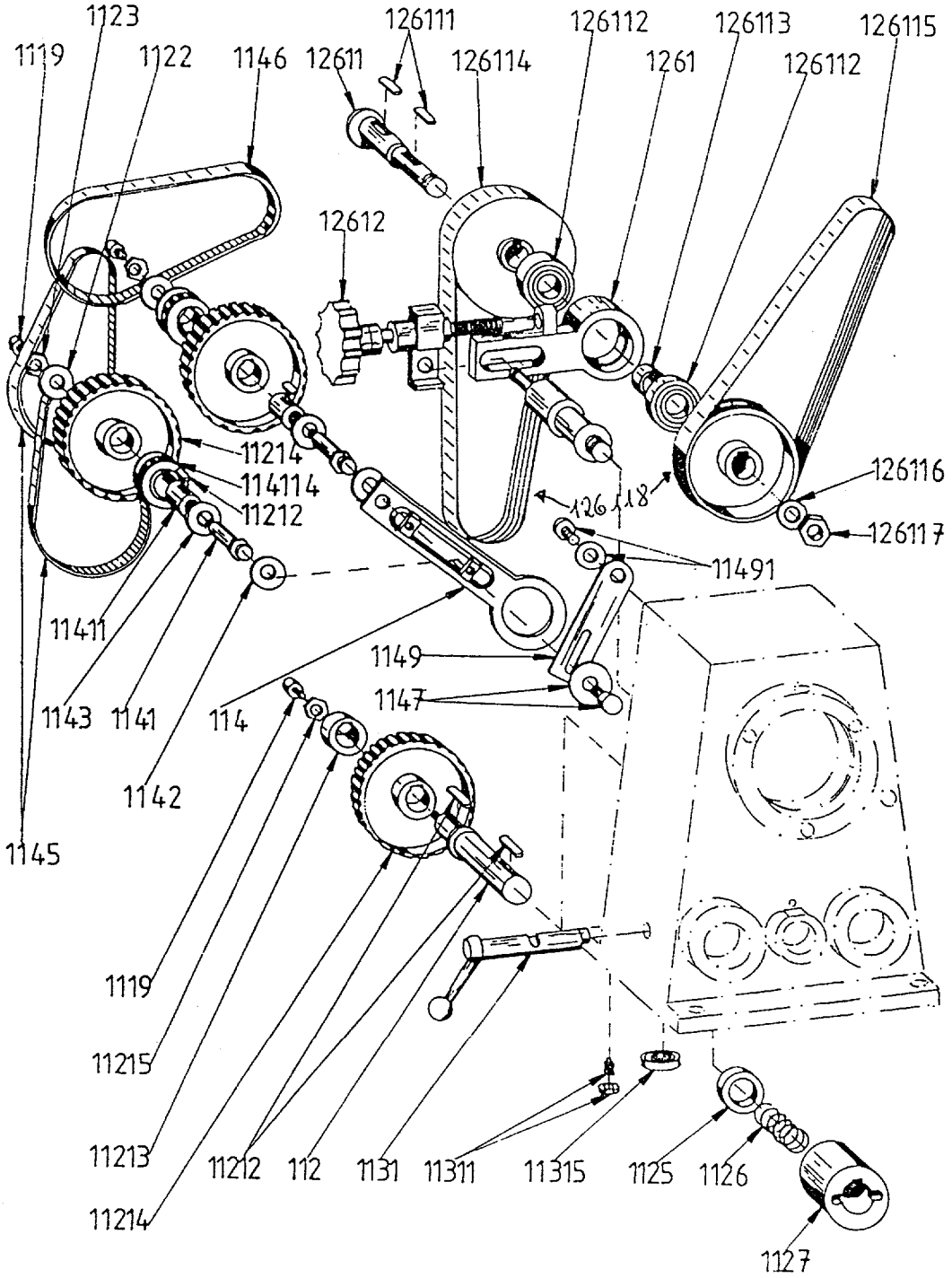
13.2 Support with motor and protective cover for D2400 and D3000

Part-No.	Order-No.	Designation
125	10200125	Cover
1251	10201251	Stud bolt + radial nut
1252	10201252	Support
1253	10201253	Potentiometer for speed regulation
1254	10201254	Main switch with undervoltage release
1255	10201255	Switch right/left
1256	10201256	Motor
1260	10201260	Protective cover of limit switch
1258	10201258	Circuit board
1257	10201257	Motor cover
1259	10201259	Screws
	10201200	Collecting tray for chips and coolant



13. Drawings and list of parts

13.3 Lead screw drive
for D2400 and D3000



13. Drawings and list of parts

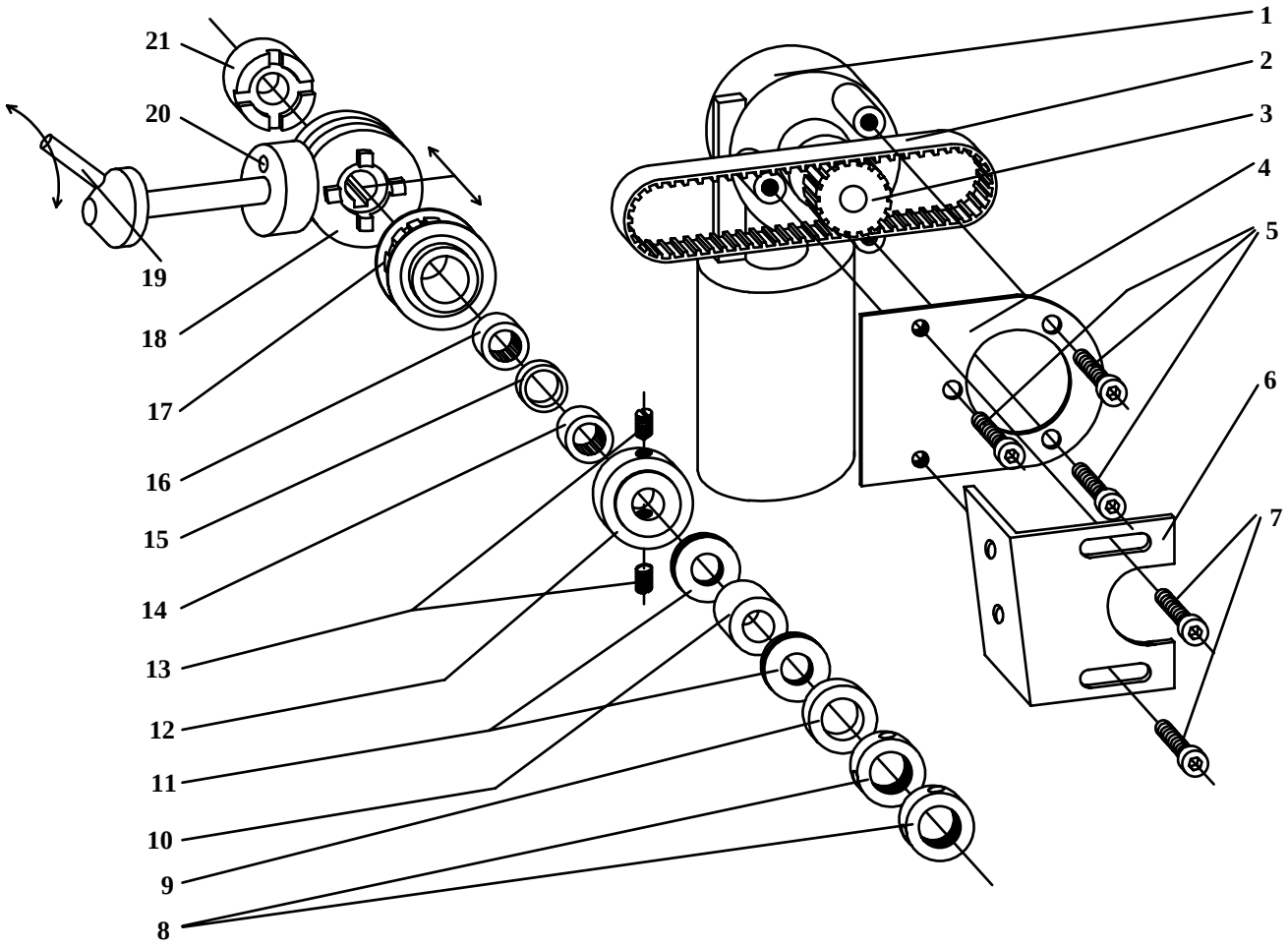
13.3 Lead screw drive

for D2400 and D3000

Part-No.	Order-No.	Designation
1119	10201119	Lubricating nipple
1145	10201145	Toothed belt Z 120 XL037
1146	10201146	Toothed belt Z 140 XL037
1147	10201147	Hexagon socket screw + washer
1149	10201149	Quadrant holder
11491	10211491	Hexagon socket screw + washer
1261	10201261	Clamping piece
126111	102126111	Feather key
12611	10212611	Axis
126112	102126112	Ball bearing
126113	102126113	Spacer sleeve
126114	102126114	Drive belt with belt pulley
126115	102126115	Drive belt with belt pulley
126118	102126118	Drive belt J 8-559 **for D2400**
126116	102126116	Washer
126117	102126117	Stop nut
12612	10212612	Spindle guide, complete
112	10200112	Feed shaft
11212	10211212	Feather key
11213	10211213	Bushing
11214	10211214	Toothed belt pulley Z48
1122	10201122	Washer
1123	10201123	Nut
1125	10201125	Adjusting ring
1126	10201126	Pressure spring
1127	10201127	Coupling
1131	10201131	Eccentric shaft, complete
11311	10211311	Stud bolt + nut
11315	10211315	Ball bearing
114	10200114	Change gear quadrant
1141	10201141	Hexagon bolt
11411	10211411	Bronze bushing
11215	10211215	Nut
114114	102114114	Toothed belt wheel Z 14
1142	10201142	Washer
1143	10201143	Washer
114816	102114816	Change gear Z16 (without picture) optional
114818	102114818	Change gear Z18 (without picture) optional
114820	102114820	Change gear Z20 (without picture) optional
114822	102114822	Change gear Z22 (without picture) optional
114824	102114824	Change gear Z24 (without picture) optional
114828	102114828	Change gear Z28 (without picture) optional
114832	102114832	Change gear Z32 (without picture) optional
114834	102114834	Change gear Z34 (without picture) optional
114836	102114836	Change gear Z36 (without picture) optional
114840	102114840	Change gear Z40 (without picture) optional
	10201100	Belt set compl. 5 pieces **for D2400** consists of: Part-No. 1145 (2x) Part-No. 1146 (1x) Part-No. 126118 (2x)
	10201101	Change gears 1 set 10 pieces Z16 - Z40

13. Drawings and list of parts

13.4 Lead screw drive for D3000



13. Drawings and list of parts

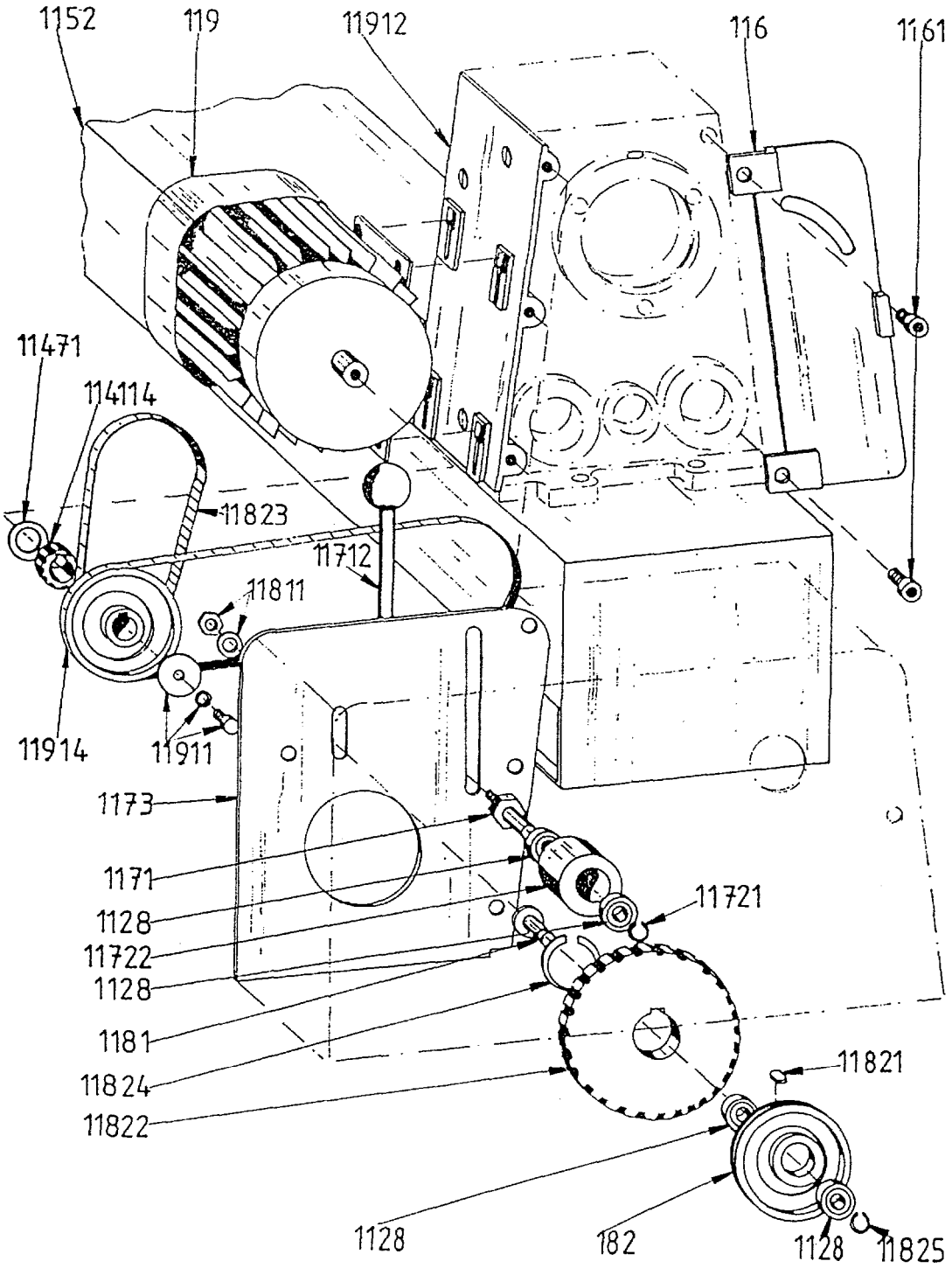
13.4 Lead screw drive

zu D3000

Part-No.	Order-No.	Designation
1	10300001	D.C. Motor
2	10300002	Toothed belt
3	10300003	Toothed belt wheel
4	10300004	Motor holder
5	10300005	3 screws
6	10300006	Bracket
7	10300007	2 screws
8	10300008	2 adjusting nuts
9	10300009	Pressure ring
10	10300010	Bushing
11	10300011	2 thrust bearings
12	10300012	Thrust washer
13	10300013	2 screws
14	10300014	Needle bearing
15	10300015	Distance ring
16	10300016	Needle bearing
17	10300017	Toothed belt wheel
18	10300018	Clutch disk
19	10300019	Gear lever
20	10300020	Operating pin
21	10300021	Threadcutting coupling

13. Drawings and list of parts

13.5 Drive with gear transmission for D2000



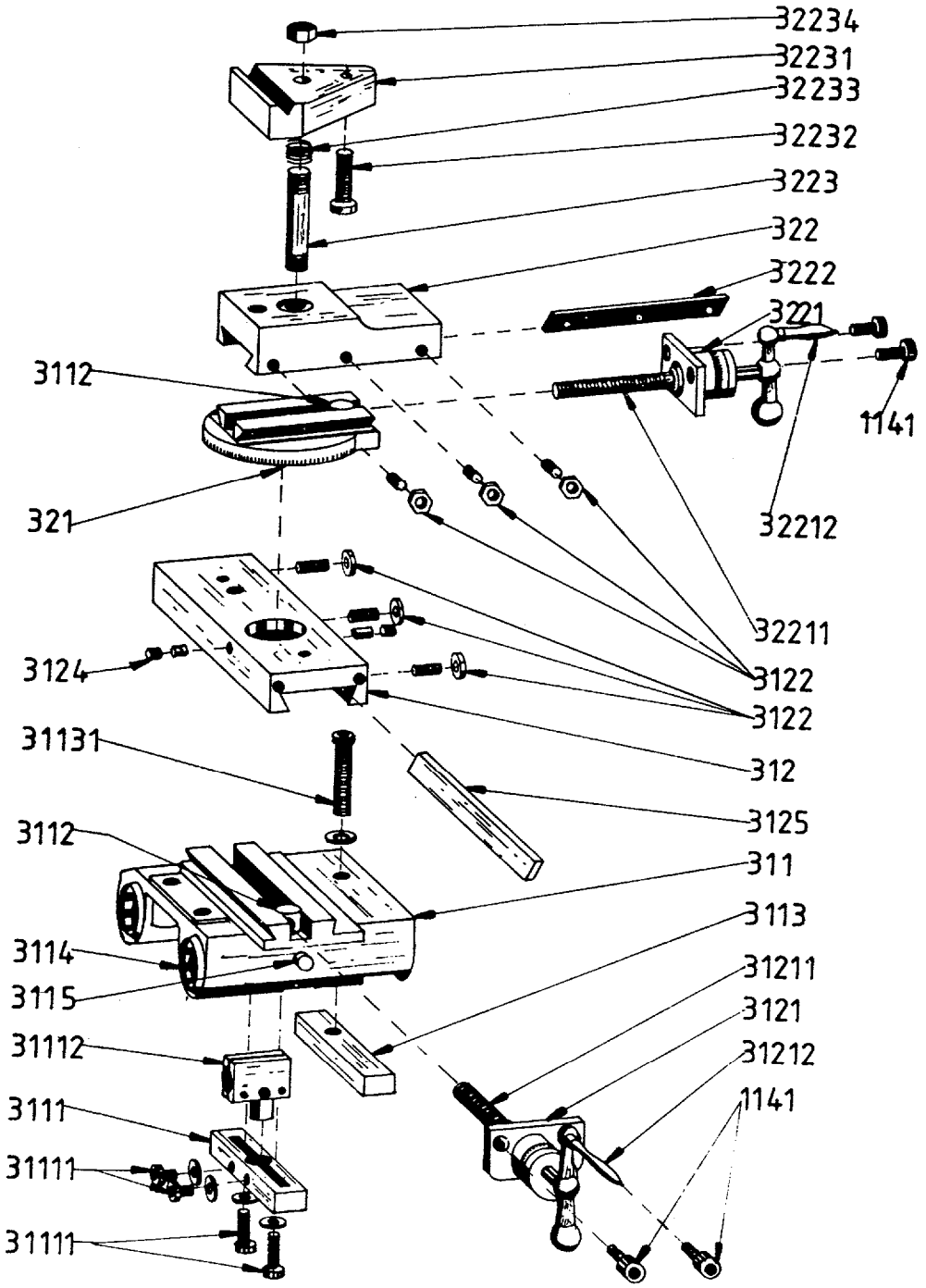
13. Drawings and list of parts

13.5 Drive with gear transmission for D2000

Part-No.	Order-No.	Designation
1152	10101152	Support
119	10100119	with A.C. motor
119	10101120	with three phase current motor
11912	10111912	Retaining plate
116	10100116	Mounting support of quadrant
1161	10101161	Hexagon socket screw
11471	10111471	Washer
114114	102114114	Toothed belt pulley Z 14
11823	10111823	Toothed belt
11914	10111914	Drive belt J 610
11911	10111911	Screw with washer
1173	10101173	Retaining plate
11811	10111811	Nut and washer
11712	10111712	Adjusting rod
1171	10101171	Axis
1128	10101128	Ball bearing
11722	10111722	Roller
11721	10111721	Retaining ring
1181	10101181	Axis
11824	10111824	Retaining ring
11822	10111822	Toothed belt pulley
182	10100182	Belt pulley
11821	10111821	Feather key
11825	10111825	Retaining ring

13. Drawings and list of parts

13.6 Cross support



13. Drawings and list of parts

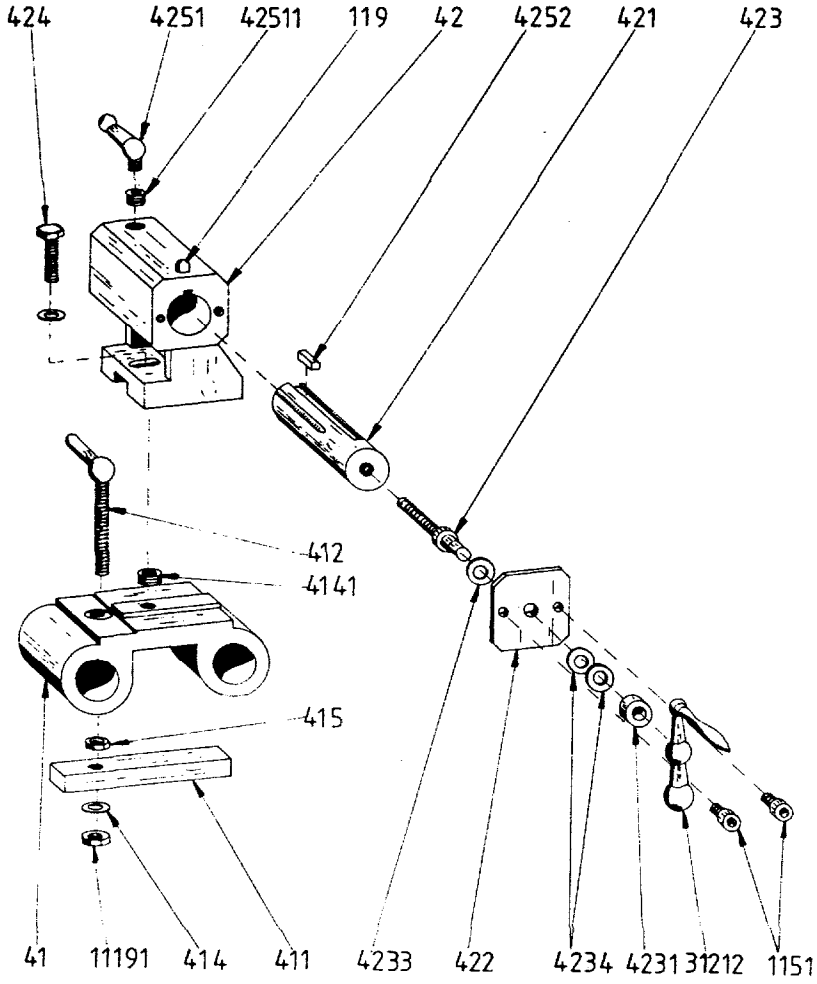
13.6 Cross support

Part-No.	Order No.	Designation
311	10200311	Lower part of transversal support
3111	10203111	Nut holder
31111	10231111	Bolts + washer
31112	10231112	Bronze nut
3112	10203112	Bronze nut
3113	10203113	Shim
31131	10231131	Clamping bolt
3114	10203114	Wiper ring
3115	10203115	Lubricating nipple
312	10200312	Upper part of transversal support
3121	10203121	Spindle bearing compl. with graduated ring
31211	10231211	Spindle
31212	10231212	Ball-ended crank
1141	102W1141	Hexagon socket screw
3122	10203122	Threaded pin + plain nut
3124	10203124	Threaded pin with thrust piece
3125	10203125	Readjusting gib
321	10200321	Lower part of longitudinal support
322	10200322	Upper part of longitudinal support
3221	10203221	Spindle bearing compl. with graduated ring
32211	10232211	Spindle for longitudinal support
32212	10232212	Ball-ended crank
3222	10203222	Readjusting gib
3223	10203223	Stud bolt
32231	10232231	Clamping plate
32232	10232232	Hexagon bolt
32233	10232233	Pressure spring
32234	10232234	Thick nut
	10200300	Longitudinal support compl. Parts-No. 321 - 3112 - 3122 - 32211 - 32212 - 1141 - 3221 - 3222 - 322 - 3223 - 32232 - 32233 - 32231 - 32234
	10200301	Transversal support compl. Parts-No. 3124 - 31131 - 3112 - 3114 - 3115 - 31112 - 3111 - 31111 - 3122 - 312 - 3125 - 311 - 3113 - 31211 - 3121 - 31212 - 1141
	10200302	Cross support compl.
	10200303	Spindle compl. for transversal support Parts-No. 3121 - 31212 – 31211
	10200304	Spindle compl. for longitudinal support Parts-No. 3221 - 32211 – 32212

13. Drawings and list of parts

13.7 Tailstock

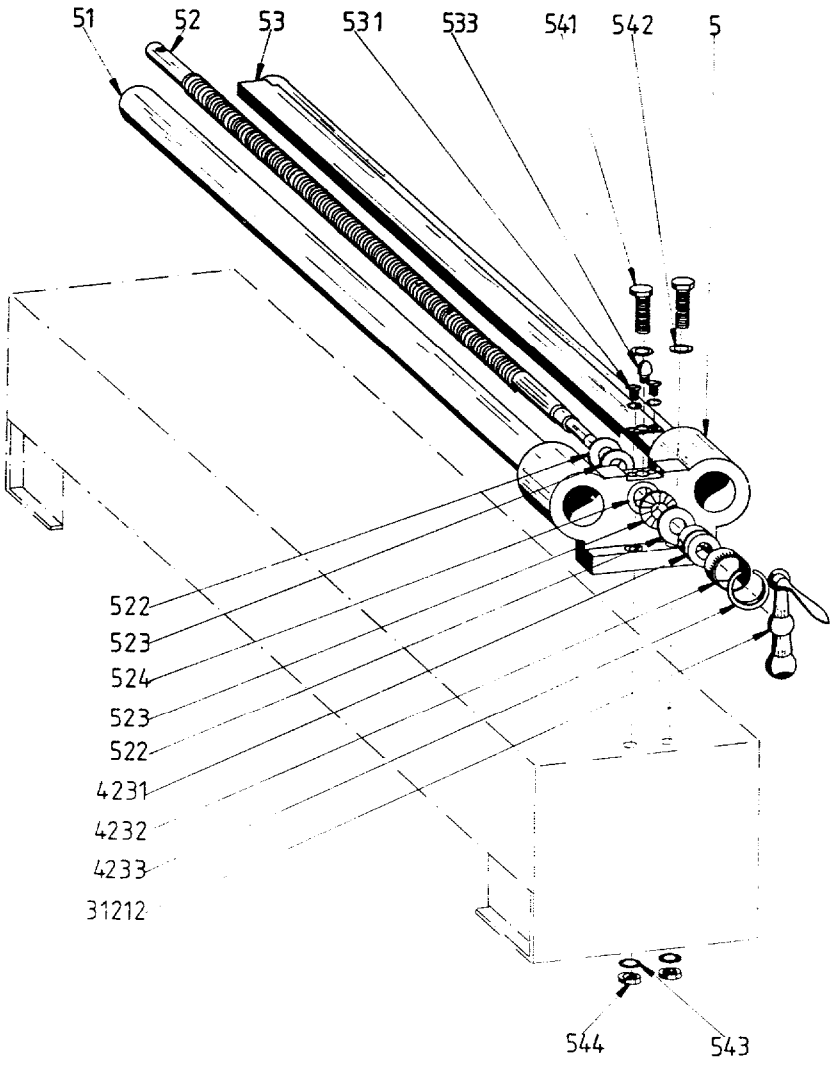
Part-No.	Order-No.	Designation
41	10200041	Lower part of tailstock
411	10200411	Shim
412	10200412	Capstan with stud bolt
414	10200414	Washer
415	10200415	Hexagon nut
42	10200042	Upper part of tailstock
421	10200421	Spindle sleeve
422	10200422	Flange
1151	10201151	Hexagon socket screw
423	10200423	Spindle
4231	10204231	Adjusting ring
4234	10204234	Spring washer
4233	10204233	Washer
31212	10231212	Ball-ended crank
424	10200424	Hexagon bolt with washer
4251	10204251	Capstan with clamping bolt
42511	10242511	Insert
4141	10204141	Insert
4252	10204252	Feather key
119	10200119	Lubricating nipple
	10200400	Tailstock compl. without lathe centre



13 Drawings and list of parts

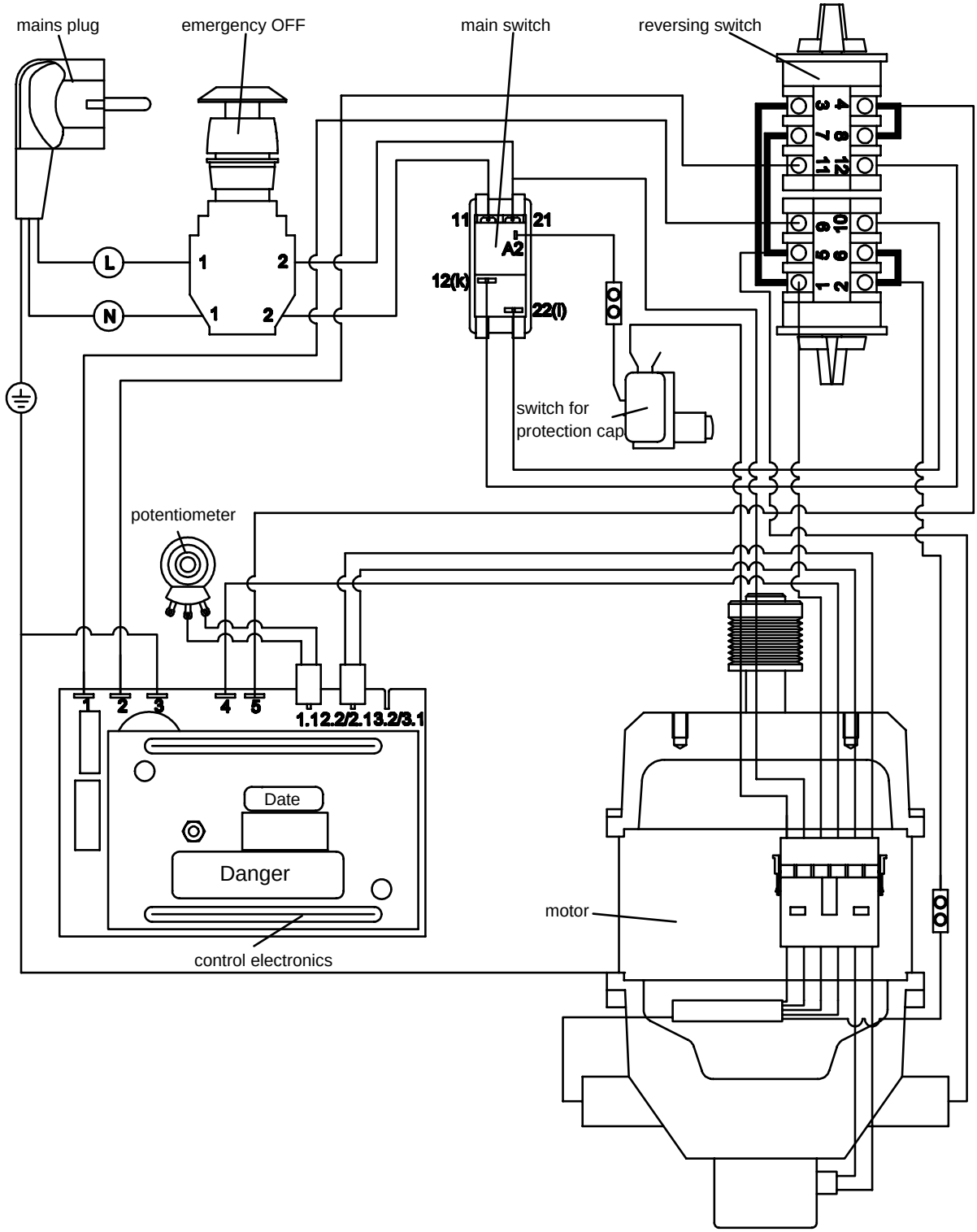
13.8 Rear bearing with guide rods

Part-No.	Order-No.	Designation
5	10200005	Rear bearing (only the cast iron part)
51	10200051	Guide rods
52	10200052	Feed spindle
522	10200522	Washer
523	10200523	Thrust needle-bearing
31212	10231212	Ball-ended crank
4231	102H4231	Spacer sleeve
524	10200524	Bronze bushing
53	10200053	Protective channel
531	10200531	Screw + washer
4232	10204232	Graduated ring
4233	10204233	Retaining ring
533	10200533	Lubricating ring
541	10200541	Hexagon bolt
542	10200542	Washer
543	10200543	Serrated lock washer
544	10200544	Hexagon nut
	10200500	Rear bearing compl.



14. Circuit diagram

14.1 For D2000 and D2400



14. Circuit diagram

14.2 for D3000